Faculty of Health, Science and Technology
Environmental and Energy Systems

Syllabus

Fundamentals of Thermal and Fluid Sciences

Course Code:	EMG131
Course Title:	Fundamentals of Thermal and Fluid Sciences *Grundläggande värme- och strömningslära*
Credits:	7.5
Degree Level:	Undergraduate level
Progressive Specialisation:	First cycle, has less than 60 credits in first-cycle course/s as entry requirements (G1F)

Major Field of Study:
MEI (Environmental and Energy Systems)

Course Approval
The syllabus was approved by the Faculty of Health, Science and Technology 2016-03-07, and is valid from the Autumn semester 2016 at Karlstad University.

Prerequisites
EMG111 Introduction to Energy Systems 7.5 ECTS cr and EMG121 Sustainable Development in Engineering 7.5 ECTS cr, or equivalent

Learning Outcomes
The aim of the course is that students develop the fundamentals of thermal and fluid science, broaden and enhance their knowledge with concepts and facts and be acquainted with using standard problem solving methods for thermal and fluid engineering systems.

Upon completion of the course, students should be able to:
- explain the difference between the hydrostatic and hydrodynamic pressure concepts,
- explain the difference between laminar and turbulent flow and give examples of applications where turbulence is desirable and undesirable, respectively,
- apply and interpret the continuity equation and Bernoulli 's equation in calculations,
- describe and apply different methods for measuring the pressure of fluids and flows,
- give an account of different types of flow regulation and their consequences,
- calculate the dimensions of an energy efficient pump or fan for a given pipe or channel systems,
- apply the ideal gas law in calculations,
- apply dimensionless numbers in thermal and fluid calculations,
- set up energy, effect and mass balances for thermal and fluid engineering systems,
- apply and interpret thermal and fluid circuit diagrams in calculations,
- calculate heat transfer through plane and circular sections,
- describe and apply the concepts enthalpy, k-value, U-value, cooling and heating factors,

- give an account of laboratory work with an emophasis on methods and results,
- perform accurate measuring,
- apply basic statistical methods to completed thermal and fluid engineering calculations and laboratory work.

Content
Hydrostatics
Hydrodynamics
Pressure concepts
Continuity equation
Bernoulli's extended equation
Fans
Pumps
Flow measuring
System demarcation
Cooling machines
Heat exchanger
Thermodynamic concepts and processes
Heat transfer
Ventilation
Problem solving methodology
Thermal and fluid engineering laboratory sessions
Report writing
Sensitivity analysis

Reading List
See separate document.

Examination
Assessment is based on written exams and written laboratory reports.

Grades
One of the grades Pass with Distinction (5) Pass with Some Distinction (4), Pass (3) or Fail (U) is awarded in the examination of the course.

The final exam is graded along the scale of U/3/4/5.
Laboratory assignments are graded Fail (U) or Pass (G).

Quality Assurance
Follow-up relating to learning conditions and goal-fulfilment takes place both during and upon completion of the course in order to ensure continuous improvement. Course evaluation is partly based on student views and experiences obtained in accordance with current regulations and partly on other data and documentation. Students will be informed of the result of the evaluation and of any measures to be taken.

Course Certificate
A course certificate will be provided upon request.

Additional information
The local regulations for studies at the Bachelor and Master levels at Karlstad University stipulate the obligations and rights of students and staff.